

PART ONE

HOW WE DIVIDE
THE WORLD UP:
ECONOMICS

SUPPLY AND DEMAND

Markets are the forums in which we trade goods and services, and at the heart of the market is the concept of supply and demand. The term *market* encompasses a broad range of senses – we may, for instance, be talking about a local fruit and veg market or a mighty stock exchange, or perhaps even about the all-encompassing abstract market that governs all of humanity’s transactions.

The market – in any sense you may wish to think of it – aims to achieve a balance between the types and volumes of goods and services provided by suppliers and those goods and consumers demanded by consumers. To understand how the market regulates itself, it is essential to understand the principles of supply and demand. Yet the relationship between the two sides of the equation is incredibly fluid, with its centre of gravity ever changing.

Demand, in simple terms, relates to the amount of a goods or service that consumers want at a certain price. *Supply*, on the other hand, is concerned with the quantity of a good or service that producers make available at a given price. Both consumers (who inhabit the *demand* side) and suppliers face key questions as they approach a transaction from their opposing positions.

Firstly, the consumer must decide whether they want a particular product, and then whether they are prepared to pay the price being asked by the supplier. Question One tends to be easy to answer. Do I want that tasty sandwich for my lunch? Yes, please. Do I want that ripped dress in a colour that doesn’t suit me? No thanks! But the second question is far more vexed. Are you happy to pay £4.00 for that sandwich or would you rather save that money and spend it on something else? Would you make a different decision if the price was £3.00? What does

the consumer want and how much do they want it – these are the key forces that determine demand.

The supplier, meanwhile, faces related but nonetheless very different questions. First and foremost, is there demand for what I am planning to offer the market? Are there hungry people in search of lunch who will buy my sandwiches? If so, how much can I charge? I want to make the most profit, so I need to establish a price that is above what it costs me to supply a sandwich (this isn’t a charity!) but not above the maximum that the most people are willing to pay.

‘The internet moves us closer to ‘perfect information’ on markets. Individuals and companies alike can buy and sell across borders and jurisdictions wherever they find the best match of supply and demand.’

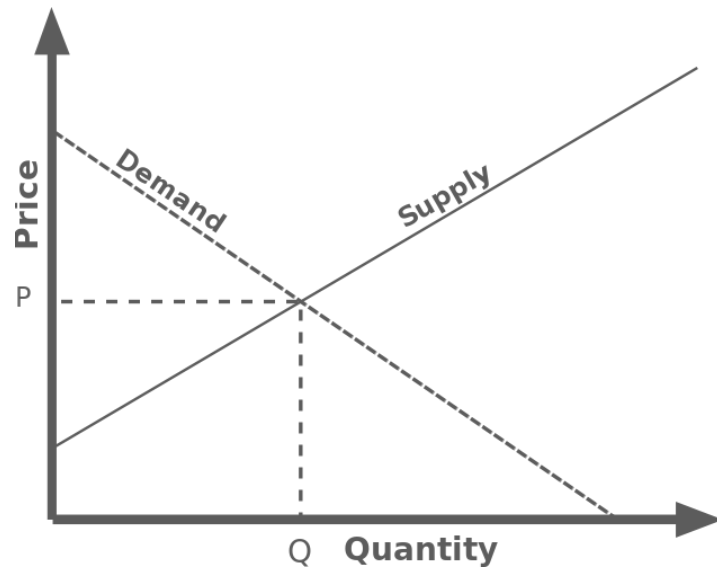
Milton Friedman

The general law of supply and demand is straightforward: if all other factors remain the same, the lower the price of a good or service, the more people will demand it; on the other hand, as demand grows, suppliers will seek to provide more and at a greater price, so maximizing their profit. But in reality, there are a number of other factors at work. Our potential sandwich-buyer, for example, may or may not be prepared to seek out a less tasty but cheaper sandwich. Or they might be watching their weight, so go to a shop selling salad instead. Or perhaps they are frightened of spilling mayonnaise from a sandwich down their new suit, so choose to eat something entirely different. Demand can be subject to all sorts of inponderable variables beyond price.

The supplier, meanwhile, might find that a drought has led to a shortage of wheat, forcing up the price of bread and so making it more

expensive to stock the shop. Or perhaps the shop's rent has gone up, forcing the sandwich-seller to raise prices. Alternatively, a burst water pipe closes the high street so all the local trade finds a new place to buy their sandwiches. Just as with demand, it is difficult to predict all the factors that might affect supply.

Nonetheless, in broad terms supply and demand are inversely proportional to each other in relation to price. That is to say, as price increases demand broadly declines and supply grows, while a price decrease sees supply fall and demand grow. If you plot their relative trajectories on a graph, the point at which they cross signifies market equilibrium – the holy grail of the market, where supply exactly matches demand.



Supply and demand, the backstone of a market economy

PART TWO

HOW WE THINK ABOUT THE WORLD: PHILOSOPHY

UTILITARIANISM

Utilitarianism is the philosophy famously set out in the writings of the English lawyer Jeremy Bentham in the late-eighteenth century. In his *Principles of Morals and Legislation* (completed in 1780 and published in 1789), he laid out the central tenet of utilitarianism: an action may be considered good if it promotes ‘the greatest happiness for the greatest number’.

Utilitarianism may be seen in part as a response to the belief – one burgeoning in Bentham’s lifetime – in the supremacy of the rights of the individual, a notion that found perhaps its greatest expression in the US Declaration of Independence of 1776. Indeed, the Declaration prompted him to write a blistering critique, entitled *Answer to the Declaration of the American Congress*, in which he dismissed the very idea of those ‘natural’ and ‘inalienable’ individual rights enshrined in the Declaration – including the pursuit of happiness ‘wherever a man thinks he can see it, and by whatever means he thinks he can attain it’.

Rather than the pursuit of individual happiness, utilitarianism is based on the idea that every decision is either more or less efficient than any other in terms of ‘utility’ (that is to say, the most efficient generation of happiness and pleasure, which in turn is related to the absence of pain). According to Bentham, an action that conforms to the principles of utility is, therefore, a ‘good’ action and ought to be undertaken. Alternatively, an action that increases pain and unhappiness should be rejected. As he put it: ‘Nature has placed mankind under the governance of . . . pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we shall do.’ Logically, an action that brings happiness to a single individual is less good than an action that brings happiness to many.

Keen on putting his ideas into practice, Bentham designed his famous prison, the Panopticon. This was a circular structure in which prisoners were incarcerated around a central observation tower, unable to tell whether they were being watched at any given moment – or indeed whether there was anyone in the Tower at all – thereby being trained to monitor their own behaviour. Bentham believed that, since all punishment is pain, it is only justified if it is outweighed by the reduction in pain it causes in somebody else. So it is fine if people are deterred from doing things that would lead to more pain, but there is no point in punishment for punishment’s sake.

It was Bentham’s hope that the adoption of utilitarianism would bring about simpler and more just government, where the good of the many is always prioritized, so cutting back the risk of injustice and personal grievance. He also believed that privileging the greater number over the few would bring about greater social equality. Moreover, since he considered all sources of pleasure to be of equal value (from attending the opera to drinking a cup of tea to doing charitable works), he believed neither gender, nor social status nor ability would act as a bar to access to happiness.

Bentham’s ideas were taken up and adapted in the early nineteenth century by John Stuart Mill, who knew Bentham personally through his own philosopher father. While Mill concurred with the idea of ‘the greatest happiness for the greatest number’, he differed from Bentham over how utility ought to be measured. Where Bentham said all sources of happiness were equal, Mill argued for a qualitative distinction between ‘higher pleasures’ (e.g. intellectual and moral pursuits) and lower pleasures (e.g. sensual pleasure). The ‘lower pleasures’, Mill said, were often more

greatly enjoyed only because people had limited experience of the 'higher pleasures'. Furthermore, he suggested, those who aspire to the higher pleasures ultimately bring greater benefit to society – by, for instance, promoting culture, education and charity – than those interested only in seeking the lower pleasures. By most valuing the higher pleasures, he believed, we would move closer still to a society that truly achieves 'the greatest amount of happiness altogether'.

PART THREE

UNDERSTANDING
THE WORLD:
SCIENCE

RELATIVITY

When we talk about ‘the theory of relativity’, we are actually referring to the ideas contained within two distinct papers written by the physicist Albert Einstein eleven years apart. Taken together, they turned upside-down our previous assumptions about physics and cosmology and brought about a genuine scientific revolution, the full implications of which are still being explored today.

The first paper appeared in 1905 and outlined his Special Theory of Relativity, which came out of a thought experiment he conducted when he was just sixteen. A thought experiment is an experiment carried out solely in the mind – usually because the physical evidence to prove or disprove the hypothesis is unavailable or too difficult to obtain. In Einstein’s case, he imagined riding alongside a light beam and came to the conclusion that if he could keep up with it, the beam would appear to be stationary – in just the same way as if you were sitting in a railway carriage, staring at another train going in exactly the same direction and at the same speed as you. Yet he knew that such a phenomenon ran contrary to established scientific theories, so he carried out another thought experiment.

This time he imagined a moving train struck by lightning at both its ends at precisely the same moment. Einstein wondered how the event might seem to a stationary observer on an embankment and to someone aboard the train. The person on the embankment, in line with the middle of the train as the lightning strikes, sees the two bolts simultaneously. However, the person on the train is travelling in the direction of the bolt that hits the front of the train, so sees that one momentarily before the other bolt. In other words, the exact same event appears to happen at different times to different observers.

Drawing on his knowledge of the work of, for example, James Clerk Maxwell, Henri Poincaré and Heinrich Lorentz, Einstein reached the somewhat esoteric conclusions that the laws of physics are the same for all observers moving at constant velocity relative to each other, and that the speed of light in a vacuum is constant. So what is it that makes the Special Theory so important? Because for centuries, the world had accepted Isaac Newton’s proofs that space and time were absolutes, but now Einstein was arguing that they were not after all. In Einstein’s own words, the Special Theory of Relativity ‘employs a modification of the theory of space and time’.

Nor did Einstein rest on his laurels. He wanted to establish rules that were general and universal, and the Special Theory frustrated him because it applied to only very specific conditions (where motion is at a constant velocity and in a straight line). So he conducted yet another thought experiment – this time about a man floating freely in an enclosed box as it free-falls through space. If the man in the box takes off his watch, that too floats freely beside him. It feels to the man as if he is inside a box sitting still in a non-gravitational field, even though gravity is pulling the box towards the Earth. Equally, if the box was speeding up through space far from the pull of gravity, the subject inside would be pushed to the floor just as if he *was* being pulled by gravity. Traditionally, gravity and acceleration were regarded as different phenomena, though both related to mass. Einstein now realized that gravitational mass and inertial mass are equivalent – an idea that he called the Equivalence Principle.

‘Time travel used to be thought of as just science fiction, but Einstein’s general theory of relativity allows for the possibility that we could warp space-time so much that you could go off in a rocket and return before you set out.’

Stephen Hawking

Thinking about the free-falling box again, he also concluded that if you pierced a hole in one of its sides, a beam of light would hit the opposite wall at a higher point than it entered, its trajectory having been bent by gravity. In other words, light under the influence of gravity does not always – as had been assumed until then – travel in straight lines. Now he could extend the Special Theory to relate it to any sort of motion, whatever the acceleration and direction.

The General Theory showed how gravity warps both time and space, and also provided the field equations to explain how gravity acts on matter and how matter generates gravity by curving space-time. To picture this last concept, think of a basketball on a trampoline. The fabric of the trampoline bends as the ball travels across it and comes to rest. Add a second ball and it rolls until coming to rest next to the first ball. This is not because the first ball exerts some mysterious force on the second, but simply because the trampoline fabric has been warped by Ball One. Matter (Ball One) under the influence of gravity has curved space (the trampoline fabric), which in turn causes Ball Two to behave in a particular way.

To summarize, where Newton described a universe in which an apple falls from a tree to the ground because gravity exerts a force of attraction, Einstein redefined gravity as a curvature of space-time. Among its many contributions to science, the General Theory opened the way

to our greater understanding of phenomena including black holes, worm holes and the Big Bang. In the words of physicist Max Born, the theory counts as ‘the greatest feat of human thinking about nature – the most amazing combination of philosophical penetration, physical intuition and mathematical skill.’